# Ch. 23- 25 Review

① $\mu = 521$ — 1 sample t-test

$n = 100$

$\bar{x} = 589$ — $H_0: \mu = 521$

$s = 37$ — $H_a: \mu > 521$

$\alpha = 0.05$

## Conditions

| | |
|---|---|
| ① SRS | ① assumed random sample |
| ② pop $\geq 10n$ | ② there are more than 1000 Harvard Law students |
| ③ normal or $n \geq 30$ | ③ $n = 100 \geq 30$ |

* conditions met → student's t-model → 1 sample t test

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 18.3783$$

$$P(t > 18.373 \mid df = 99) = 5.6007 \times 10^{-34}$$

- We reject Ho b/c p-value of $5.6007 \times 10^{-34} < \alpha = 0.05$
- We have sufficient evidence that the true average LSAT score for Harvard freshman is greater than 521 pts.

Old book (last year)
new book (this year)  2 sample t-test

(2) $\alpha = 0.01$

Conditions

(1) 2 indep. SRS

(1) stated random
assumed last yr. + this yr. are independent

(2) $pop_1 \geq 10n_1$
$pop_2 \geq 10n_2$

(2) There are more than 150 students both years

(3) 2 normal pop's
or $n_1$ and $n_2 \geq 30$

(3) Normal prob. plots show approx. linear for both data sets ⇒ approx. normal

conditions met → Student's t-distrib → 2 samp. t Test

$H_0: \mu_L = \mu_T$
$H_a: \mu_L < \mu_T$

L = last year
T = this year

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = -1.703$$

$P(t < -1.703 \mid df = 26.164) = 0.0502$  $\alpha = 0.01$

- We fail to reject Ho b/c pvalue of $0.0502 > \alpha = 0.01$.
- We have insufficient evidence that avg. score for new book is greater than the old book.

Before & After $\Rightarrow$ paired test

3 1 sample paired t-test

$H_0: \mu_d = 0$

$H_a: \mu_d < 0$

difference = after - before

Conditions

1 Paired data

1 measurements are before & after on same athletes

2 SRS

2 this team is representative of all people that would go to the speed & agility camp.

3 pop $\geq 10 n_d$

3 There are more than 150 people (athletes) that go to the camp.

$\boxed{\text{Conditions met} \rightarrow \text{Student's t-distribution} \rightarrow \text{Paired 1 sample t-Test}}$

4 normal pop. of diff. or $n_d \geq 30$

4 Normal prob. plot is approx. linear $\Rightarrow$ approx. normal

(5) continued....

$$t = \frac{\bar{x}_d - \mu_d}{s_d / \sqrt{n_d}} = -4.387$$

$$P(t < -4.387 \mid df = 14) = 3.103 \times 10^{-4}$$

- We reject $H_0$ b/c p-value (of $3.103 \times 10^{-4}$) $< \alpha = 0.05$.
- We have sufficient evidence that the avg. difference between ~~before~~ after & before times is less than 0 seconds.
- The agility & speed camp did help reduce 40 yard dash times & improve speed.

(3) 95% confidence

(4) 1 sample t-Interval

Conditions

(1) SRS — (1) assumed random sample

(2) pop ≥ 10n — (2) there are more than 90 lab rats

(3) normal pop or $n \geq 30$ — (3) norm. prob. plot is ≈ linear so data ≈ normal.

conditions met → students t-model → 1 sample t-Interval

$\bar{x} \pm t^*\left(\frac{s}{\sqrt{n}}\right) = (1.3541, 1.7081)$

df = 8

We are 95% conf. that the true avg. refractory time of DDT poisoned rats is between 1.3541 and 1.7081 milliseconds.

There is evidence that the avg. time for poisoned rats is greater than that for unpoisoned, since 1.3 milliseconds is not in our 95% conf interval.

chart w/ info

(5) $n_1 = 133$ $n_2 = 162$ 96% confidence

$\bar{x}_1 = 25.34$ $\bar{x}_2 = 24.94$

$s_1 = 5.05$ $s_2 = 5.10$

2 sample t-Interval

Conditions:

(1) 2 independent SRS (1) assumed 2 independent + random samples

(2) pop.$_1 \geq 10n_1$ (2) There are more than

pop$_2 \geq 10n_2$ 1330 male and 1620 female college students.

(3) 2 normal populations (3) $n_1 = 133$, $n_2 = 162$ $\geq 30$

or $n_1$ and $n_2 \geq 30$

conditions met → student's t-model → 2 sample t-Interval

$$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} = (-0.8247, 1.6247)$$

We are 96% confident that the difference btw. the avg. male + female social insight scores is btw −0.8247 and 1.6247 points.

This gives us evidence that there is <u>no</u> difference btw. the average social insight of males + females b/c 0 is included in the interval.